

APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC-2003-003 A

TITLE Accumulator Package De-installation/Installation - ECLSS/TCS #1, #2 Rack
E5533 General Purpose Hoisting

DOCUMENT NUMBER/TITLE JTP-21028 De-installation AP/GSU/TCA-MU-1-ECLSS/TCS #1 Rack,
JTP-xxxxx(TBA) Installation AP ECLSS/TCS #2 Rack (TBA), JTP-xxxxx(TBA) Installation AP-ECLSS/TCS #1 Rack (TBA)

PREPARED BY JAXA JEM PI / S & PA

DATE Jan 2004

REQUIRED APPROVAL

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NASA SUSPENDED LOAD OPERATION ANALYSIS/APPROVAL (SLOAA)

OPERATION:

Uninstallation:

1. To set up the Accumulator Package (AP) Lifting Device Kit. —*This operation is not work under suspended load.*
2. To position the AP Lifting Device Kit over ECLSS/TCS#1 Rack or #2 Rack.
3. To attach the slings to the AP frame.
4. To lift the AP up from the ECLSS/TCS#1 Rack or #2 Rack, using turnbuckles ,chain hoist and crane operation.
5. To lift the AP and move to the floor by a crane. —*This operation is not work under suspended load.*

Installation:

1. To set up the Accumulator Package (AP) Lifting Device Kit. .—*This operation is not work under suspended load.*
2. To position the AP Lifting Device Kit over AP.
3. To attach the slings to the AP frame.
4. To position the AP on ECLSS/TCS#1 Rack or #2 Rack by a crane.
5. To lift the AP down to the ECLSS/TCS#1 Rack or #2 Rack, using turnbuckles ,chain hoist and crane operation.

SUPPORTING DOCUMENTS:

The associated operational procedure/systems assurance analyses are as follows:

1. JS10-129 AP Lifting Device Kit Stress Analysis Report
2. JTP 321026 De-installation AP/Measurement of installation area of FTU - ECLSS/TCS#2 RACK
3. SAA21CRS1-002, System Assurance Analysis of the 5-ton Bridge Cranes located in the Intermediate Bay at SSPF.
4. SAA21CRS1-001, 30 Ton High bay Bridge Cranes-Space Station Processing Facility (SSPF)
5. JTP 321028 De-installation AP/GSU/TCA-MV-1 - ECLSS/TCS#1 RACK
6. JTPxxxxxx (TBD) Installation AP - ECLSS/TCS#2 RACK (TBD)
7. JTPxxxxxx (TBD) Installation AP - ECLSS/TCS#1 RACK (TBD)

GENERAL DESCRIPTION:

1. When positioning AP Lifting Device Kit, 2 workers will work under the AP Lifting Device Kit.
2. When attaching 4 slings to the AP frame, 2 workers will work under the AP Lifting Device Kit.
3. When detaching/installing and lifting up/down the AP from/to ECLSS/TCS#1 Rack or #2 Rack, 3 workers will work under the AP Lifting Device Kit.
4. Installation is the reverse of Uninstallation.

RATIONALE/ANALYSIS:

The suspended load tasks comply with the NASA Alternate Safety Standard for Suspended Load Operations as follows:

Alternate Standard Requirement #1a:

These operations cannot be conducted without placing personnel or hands under the AP Lifting Device Kit during AP removal/install operations. AP Lifting Device kit operations at SSPF have been evaluated for alternate methods to complete this task, and it has been determined that there are no design, procedural, or operational means to eliminate personnel exposure to a suspended load, without exposing flight hardware to unacceptable damage.

Alternate Standard Requirement #1b:

The possible use of a secondary support system to catch the load in the event of a crane failure was analyzed. It was determined use of a secondary support system was not feasible, because there is no open space to set up a secondary support system for the reason that the operation area is limited, and because of the vertical and horizontal movement of suspended AP and positioning of the AP and ECLSS/TCS Rack under the AP Lifting Device Kit.

Alternate Standard Requirement #1c:

1. The maximum number of personnel allowed under the AP Lifting Device Kit during positioning AP Lifting Device Kit over the ECLSS/TCS#1 Rack or #2 Rack or AP is 2 workers:#1 for supporting the structure of AP Lifting Device Kit, and #2 for supporting the turnbuckles.
2. The maximum number of personnel allowed under the AP Lifting Device Kit during attaching 4 slings to the AP frame is 2 workers:#1 for supporting the AP Lifting Device Kit, and #2 is for attaching the slings.
3. The maximum number of personnel allowed under the AP Lifting Device Kit during detaching/installing and lifting up/down the AP is 3 workers:#1 for turnbuckles operation, #2 for loosening the Drive Nut, and #3 for watching the QD interface.

Alternate Standard Requirement #1d:

1. Positioning AP Lifting Device Kit over the ECLSS/TCS#1 Rack or #2 Rack or AP will be accomplished as quickly and safely as possible to minimize exposure time. It will take up to 30 minutes under suspended AP Lifting Device Kit.
2. Attaching 4 slings to the AP frame will be accomplished as quickly and safely as possible to minimize exposure time. It will take up to 30 minutes under suspended AP Lifting Device Kit.
3. Detaching/installing and lifting up/down the AP will be accomplished as quickly and safely as possible to minimize exposure time. It will take up to 45 minutes under suspended the AP Lifting Device Kit.

Alternate Standard Requirement #2: Suspended load operations are reviewed and approved on a case-by-case/specific need basis - see General Description and Alternate Standard Requirement #1.

Alternate Standard Requirement #3: Only those suspended load operations approved by the NASA Safety and Mission Assurance Division Chief will be permitted. The NASA

Safety and Mission Assurance Division will maintain a list of approved suspended load operations.

Alternate Standard Requirement #4: The work authorizing documents are written to allow only required personnel under the suspended load. The work authorizing documents are available on site for inspection during the operation.

Alternate Standard Requirement #5: A new suspended load operation not covered by this SLOAA, deemed necessary due to unusual or unforeseen circumstances where real time action is required, shall be documented and approved by the NASA Safety and Mission Assurance Division Chief.

Alternate Standard Requirement #6: The suspended load operations addressed in this analysis involve the 5 ton and 30 ton SSPF bridge cranes. The cranes are designed, tested, inspected, maintained, and operated in accordance with the NASA Standard for Lifting Devices and Equipment, NASA-STD-8719.9.

The SSPF 30 ton crane hoists are equipped with two magnetic holding brakes, each capable of holding the load up to the crane's rated capacity. Each brake's ability to hold the rated load (30 tons) is verified annually.

The SSPF 5 ton crane are equipped with emergency stop. Emergency stop ability is verified annually.

The cranes are designed to meet a 5 to 1 safety factor based on ultimate strength for the hoist load bearing components. The 5-ton and 30 ton cranes are load tested annually at 100% of their rated capacities. Detailed preventive maintenance is performed monthly, quarterly, semiannually, and annually on the cranes to ensure proper operation. Nondestructive testing of the crane hooks is performed annually.

AP lifting kit is utilized for the each operation described in page 1.

AP lifting kit: 5-ton crane is utilized for this task. The maximum weight of the AP lifting Kit is under four point lifting is 45 lbs and the payload may weigh as much as 111 lbs. The total load is 156 lbs.

AP lifting Kit is rated at 156 lbs and designed to meet 5 to 1 safety factor based on ultimate strength.

Alternate Standard Requirement #7: An SAA has been completed on the 5-ton and 30 ton bridge cranes in the SSPF. The SAA includes a Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) and a hazard analysis (see supporting documents). No critical single failure points were identified during this analysis

Alternate Standard Requirement #8: Visual inspections for cracks or other signs of damage or anomalies are performed on the hoist hooks, hoist beams, hoist cables, hoist rod assemblies, and hoist fittings, and crane functional checks are performed before each operation per NASA-STD-8719.9.

Alternate Standard Requirement #9: Trained and licensed crane operators shall remain at the hoist controls while personnel are under the load.

Alternate Standard Requirement #10: Appropriate safety control areas are established before initiating operations. Only the minimum number of people will be permitted in this area.

Alternate Standard Requirement #11: A pretask briefing and a safety walkdown of the area will be conducted prior to the lift to ensure that all systems and personnel are ready to support. All participants are instructed on their specific tasks and warned of potential hazards. Following any crew change, the new personnel are instructed by the task leader on their specific tasks and warned of any hazards involved.

Alternate Standard Requirement #12: The person beneath the suspended load will be in voice contact with the hoist operator and/or task leader. Upon loss of communication, the operation shall stop immediately, personnel shall clear the hazardous area, and the load shall be safed. Operations shall not continue until communications are restored.


Alternate Standard Requirement #13: Personnel working beneath the load shall be in continuous sight of the hoist operator and/or task leader.

Alternate Standard Requirement #14: The NASA Safety and Mission Assurance Division shall conduct periodic reviews to ensure the continued safety of suspended load procedures.

Alternate Standard Requirement #15: The NASA Safety and Mission Assurance Division will provide copies of approved SLOAAs, a list of approved suspended load operations, a list of cranes/hoists used for suspended load operations and copies of the associated FMEA/CIL and hazards analyses to NASA Headquarters.

APPROVAL:

DATE:


Bruce Jansen

2/3/04

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